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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

Communist China: Recent Trends In The Fertilizer Supply

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
November 1970

INTELLIGENCE MEMORANDUM

Communist China: Recent Trends In The Fertilizer Supply

Introduction

A major factor contributing to the rise in grain production in Communist China in recent years has been the use of more chemical fertilizer. By 1965 the Peking regime had found it necessary to sharply increase expenditures on imports of high-quality fertilizers -- which had been averaging little more than one million metric tons a year -- to supplement the output of its slowly expanding domestic fertilizer industry. Thus today China is a key participant in the international fertilizer market. At the same time, China has been pushing domestic production of chemical fertilizer both from large modern plants and from small rural plants using less advanced technology.

This memorandum reviews trends in China's total supply of chemical fertilizer in 1964-70, summarizes the pattern of Chinese imports of fertilizer from various worldwide suppliers, and examines recent developments and problems in the domestic fertilizer industry. The memorandum concludes with an assessment of Chinese Communist policy toward chemical fertilizer.

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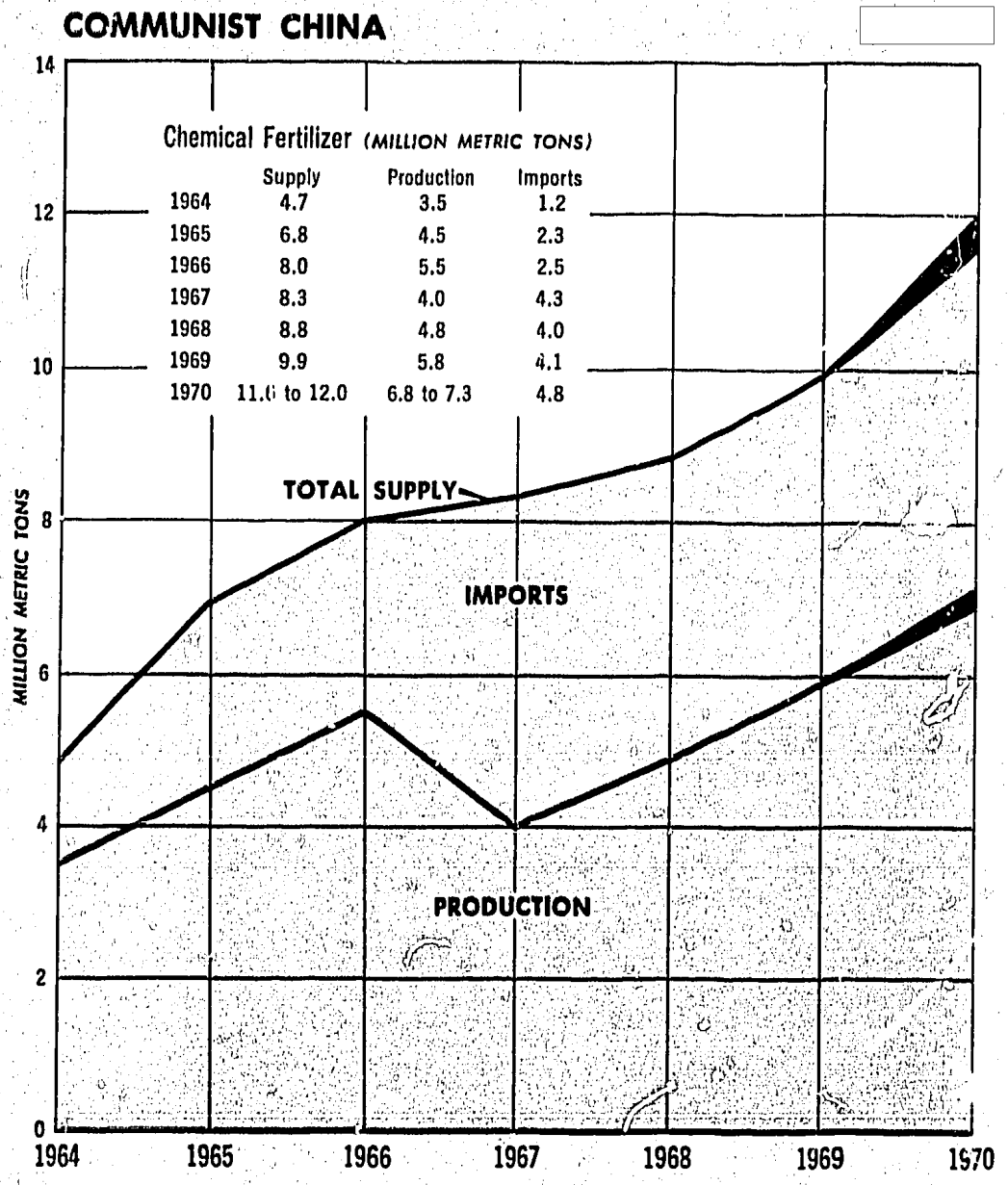
Note: This memorandum was produced solely by CIA. It was prepared by the Office of Economic Research.

Imports

1. Peking's concern over its agricultural problems is indicated by the sharp climb in both imports and domestic production of chemical fertilizer between 1964 and 1970, as depicted in the chart.



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During these years, imports quadrupled in tonnage while domestic output doubled. China's imports of chemical fertilizer are now the largest in the

world and account for 20% of total world exports. As shown in Table 1, during 1964-70 the Chinese imported about 23.3 million tons of fertilizer product of various types, containing 7.1 million tons of primary nutrients for crops, at an average annual cost of US $173 million.

2. In 1968 the sum of all contracts signed by China amounted to 4.65 million tons of fertilizer product, containing 1.47 million tons of nutrient. In 1969 the total was 4.58 million tons of product and 1.51 million tons of nutrient. In 1970 the contracted total will soar to a record level, estimated at 5.16 million tons of product and 1.82 million tons of nutrient. Fertilizer deliveries to China from major suppliers overlap calendar years because of the large size of the orders, lateness in signing contracts, or difficulties in chartering vessels. Thus, wide differences often exist between the amount contracted during a given year and the actual volume delivered in that year.

3. There is much speculation among sellers at the outset of each year as to the volume of fertilizer needed by China. As a major outlet for leading exporters in the Free World (except the United States), Peking's purchases heavily influence the world's demand and supply situation for chemical fertilizer. Large suppliers in Western Europe and Japan customarily hope to enlarge or at least maintain their share of China's orders. Because of greatly overbuilt capacity combined with the increased competition arising between exporters for sales to China in recent years, there has been a general price decline for chemical fertilizers in the world market since 1965.

Major Suppliers

4. Since 1965 the bulk of the fertilizer bought from Western Europe by China has been through Nitrex A.G. of Zurich, a cartel dealing in nitrogen fertilizer and composed of nine producers in seven countries -- Austria, Belgium, France, Italy, the Netherlands, Norway, and West Germany. Independant firms in the United Kingdom (Imperial Chemicals Industries, Ltd. -- ICI) and Italy (Azienda Nazionale Idrogenazione Carburi -- ANIC) also have become steady suppliers. In Japan, China deals with another

Table 1

Communist China:
Imports of Chemical Fertilizer a/

Year	Delivered Amount (Million Metric Tons) Product Weight b/	Equivalent Weight of Ammonium Sulfate c/	Nutrient Weight d/	Value c.&f. (Million US $)
1964	1.2	1.5	0.4	65
1965	2.3	2.8	0.6	144
1966	2.5	3.4	0.7	153
1967	4.3	5.4	1.2	200
1968	4.0	5.7	1.2	201
1969	4.1	6.2	1.3	202
1970 e/	4.8	7.9	1.7	242

a. Excluding imports of raw phosphate rock in any form.
b. Aggregate net shipping weight (excluding bagging materials) of all types and grades of imported chemical fertilizer.
c. The aggregate weight of nitrogen (N) nutrient in all imported chemical fertilizer is converted to equivalent tonnage of ammonium sulfate fertilizer, having a nitrogen content of 21%. Because of the high importance of nitrogen to agriculture and the convenience of expressing its amount in terms of a commonly used fertilizer, nitrogen is frequently reported as "equivalent weight of ammonium sulfate." The latter is derived by dividing "N weight" by 0.21.
d. Aggregate weight of primary nutrients -- nitrogen (N), phosphoric acid (P_2O_5), and potassium oxide (K_2O) -- contained in all imported chemical fertilizer.

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cartel -- Japan Urea and Ammonium Sulfate Export Co., Ltd. -- the exclusive shipper of that country's output of urea and ammonium sulfate. China's sizable imports of ammonium chloride are contracted with the Japan Union Fertilizer Co., Ltd. In all instances, Peking's purchasing representative has been China National Chemicals Import and Export Corporation (CNCIEC). The following tabulation shows the total annual shares, by area of origin, of Chinese imports of chemical fertilizer (nutrient basis)*:

	Percent		
Year	From Japan	From Western Europe	Other
1964	87	12	1
1965	54	44	2
1966	60	39	1
1967	43	55	2
1968	45	54	1
1969	48	50	2
1970	50	45	5

5. In 1969, China took its first steps to increase the number of suppliers in order to lessen its dependence on a small number of producers and export cartels in Western Europe and Japan. The entry into the market of several additional producers has put pressure on traditional large sellers, especially in sales of urea fertilizer. In 1969 the Chinese concluded their first deal with the State-owned Finnish company, Typpi Oy, for delivery of 30,000 tons of urea from that company's new plant at Oulu. Initial purchases were also made of sizable amounts of ammonium sulfate and compound fertilizers from an independent West German firm (Guano-Werke). In addition, Peking turned to Eastern Europe, after a hiatus of many years, and bought 5,000 tons of urea from Chimimport, the Bulgarian trading agency. Finally, the Kuwait Chemical Fertilizer Co. succeeded in selling

* *For details on imports of chemical fertilizer, by supplier, see the Appendix, Table 4.*

China 50,000 tons of urea valued at nearly $3 million (f.o.b.).

6. The Chinese are expected to continue to bring more suppliers into the market in an attempt to force fertilizer prices down. One of the most promising sources is the Arabian Gulf. Five countries in this region -- Iraq, Iran, Kuwait, Saudi Arabia, and Qatar -- plan to increase their returns from their vast oil and gas resources by producing nitrogen fertilizers from waste gases. Since domestic demand for nitrogen fertilizers is small in these countries, the major portion of their nitrogen output is likely to become available for export. Thus far, only Kuwait and Saudi Arabia in the Arabian Gulf have the capability to compete with China's usual suppliers.

Switch to Urea

7. After years of unchallenged dominance in the world fertilizer market, ammonium sulfate has now lost its status as the most widely traded nitrogen fertilizer and is losing its importance as a component of Chinese imports. Although ammonium sulfate is still regarded as the "standard" nitrogen fertilizer, urea has rapidly assumed an important position on the world market. By early 1969, urea accounted for one-third of total world exports of solid nitrogen fertilizers.

8. Among factors contributing to this expansion in urea sales, the most significant is the favorable transport cost of urea on a unit nitrogen (N) basis, especially over long ocean hauls when compared with other nitrogen products. This is because urea contains more than double the amount of fixed nitrogen found in ammonium sulfate. For China, increasing the volume of urea imports means savings in high ocean freight charges and reductions in tonnages handled at Chinese ports, in transport to inland farms, and in storage facilities. The share of urea in China's total imports of chemical fertilizer has risen considerably in recent years, as shown in the following tabulation:

Year	Urea as a Percent of Total Imports: Product Weight	Nutrient Weight	Value (c.&f.)
1968	34	50	45
1969	39	57	52
1970 (estimated)	52	69	66

Prices

9. Imports of chemical fertilizer during 1964-70 cost the Chinese an estimated $1.21 billion, an amount equivalent to 50% of China's outlays for grain imports in the same period. Although annual purchases have climbed, the delivered unit cost of fertilizer types has declined. The unique conditions of world market demand for particular types of fertilizer affect the type of purchases made by China and the suppliers from whom they are bought. Because freight charges on shipments from Europe to China are so much higher than those from Japan, European suppliers find they must compensate for the freight differential by slashing their unit prices to assure sales to the Chinese. To help reduce expenditures on imports, during recent years a number of Chinese-owned ships have loaded fertilizer in Europe as their homeward cargo. In October 1969, Chinese vessels for the first time began bringing fertilizer cargoes back home from Japanese ports. The tabulation below shows the comparative decline in unit prices (f.o.b.) and delivered costs (c.&f.) for two types of fertilizer sold to China by Nitrex A.G. and Japan:

	Urea: US $ per Ton 1967	1970	Percentage Change	Ammonium Sulfate: US $ per Ton 1967	1970	Percentage Change
Unit price (f.o.b.)						
Nitrex A.G.	56.00	41.04	-27	28.14	19.20	-32
Japan	58.73	49.66	-15	30.96	24.66	-20
Delivered cost (c.&f.)						
Nitrex A.G.	70.75	63.04	-11	42.89	41.20	-4
Japan	63.42	55.60	-12	34.72	30.19	-13

10. Although slight fluctuations occurred in Japanese prices (f.o.b.) during 1967-70, those of Nitrex A.G. declined in each year. As for freight charges on shipments, the situation was reversed. Shipments from Nitrex A.G. showed wide variations in freight charges during 1967-70. For example, freight costs charged to Peking on shipments from Europe to China (via the Cape of Good Hope) ranged from $14 to $22 per ton of fertilizer product. Nitrex A.G. has been able to compensate for the high charges by setting f.o.b. prices at low levels, thereby realizing in successive years a smaller delivered cost to China. As for Japanese shipments of fertilizer to China, until this year annual freight charges varied by less than $1 in any one year. In 1970, world freight rates surged upward. Rates charged on Japanese shipments of fertilizer to China rose from just under $4 to over $5 per ton. Charges on shipments from Europe to China increased 50% in the first nine months of 1970 and are now running above $22 per ton.

11. As described below, the last few years have seen worldwide fertilizer capacity expanded to a level several million tons beyond present world use. Peking shows marked shrewdness in exploiting this buyers' market in chemical fertilizers. At the outset of negotiations, the Chinese refuse to reveal their total fertilizer requirements and are able to play one supplier off against the other. Peking may drag out negotiations with a given supplier for as long as two months while the prospective seller permits his fertilizer stocks to grow in the anticipation of a lucrative sale. Eventually these stocks reach levels where the seller willingly cuts prices to reduce inventories. Such tactics have proven most effective against the strong cartels in Western Europe and Japan and have led to squeezes on their profits.

12. China is likely to maintain its strong bargaining position in the world market for some time to come. In Western Europe many producers of ammonia and nitrogen fertilizer are now pessimistic about maintaining price levels since the area has an overcapacity of two million tons of ammonia. A glut in ammonia and fertilizer has developed, partly from the startup of new, huge plants capable of producing from 900 to 1,500 tons of ammonia

daily and partly because of declining prospects for increased sales in export markets. Producers had hoped for large export orders to Eastern Europe, but these did not materialize -- instead, several of the East European countries now have sufficient capacity of their own from plants purchased earlier from the West and have begun to compete against Western Europe by offering low prices on overseas sales.

13. Export prices given to China are likely to remain below the price levels West European farmers pay for fertilizer. West European observers have forecast continuing oversupply and pressure on price through 1973. In Japan, a similar situation has developed. Three large Japanese ammonia plants of 1,000-ton daily capacity are operating and others of larger size are being built. Loss of export markets in Nationalist China and South Korea has hurt, as these countries now have surpluses and can even compete with Japan in fertilizer sales to Asian countries. While Japan's production capacity for chemical fertilizer continues to climb, producers are concerned over their growing dependence on large annual sales to China. Shipments to China during 1969 accounted for 60% of Japan's total exports of the two leading fertilizers, urea and ammonium sulfate. The Japanese nitrogen industry finds increasing difficulty in selling its products as far afield as it would like, and, in the future, sales may have to be restricted to nearer markets, including China, as competition rises in distant markets.

Domestic Production

14. Domestic production of chemical fertilizer in 1969 in China was characterized by (1) a sharp rise in output from small and medium-size plants, and (2) modest increases from a number of large fertilizer plants. Output in 1969 was approximately 5.8 million tons, or about 5% above the 1966 level. Output in 1970 could rise to between 6.8 million and 7.2 million tons, to judge from the anticipated expansion of output from both large and small plants, as described below. Table 2 shows estimated Chinese production of chemical fertilizer

during 1964-70* and the map shows the location of major chemical plants in 1970.

Table 2

Communist China:
Production of Chemical Fertilizer

Million Metric Tons

Year	Product Weight a/	Nutrient Weight b/
1964	3.5	0.68
1965	4.5	0.88
1966	5.5	1.08
1967	4.0	0.78
1968	4.8	0.94
1969	5.8	1.14
1970	6.8 to 7.2	1.33 to 1.41

a. Product weight of various types of chemical fertilizer, after conversion to Chinese "standard fertilizer units" of fixed nutrient content: nitrogen fertilizers in terms of 20% nitrogen (N); phosphorus fertilizers, 18.7% phosphoric acid (P_2O_5); and potassium fertilizer, 40% potassium oxide (K_2O).
b. Aggregate weight of primary nutrients -- N, P_2O_5, and K_2O -- contained in all types of chemical fertilizer.

Small Plants

15. Since early 1969, Peking has been reemphasizing a rapid expansion of small chemical fertilizer plants. These plants are to be built and operated with local resources, equipped with provincial help and partly by local machinery shops, and financed with locally acquired funds and some provincial subsidies.

* *For detailed estimates of production of fertilizer, including types and nutrient weights, see the Appendix, Table 5.*

COMMUNIST CHINA
MAJOR CHEMICAL FERTILIZER PLANTS, 1970

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N Nitrogen
P Phosphorus
K Potassium

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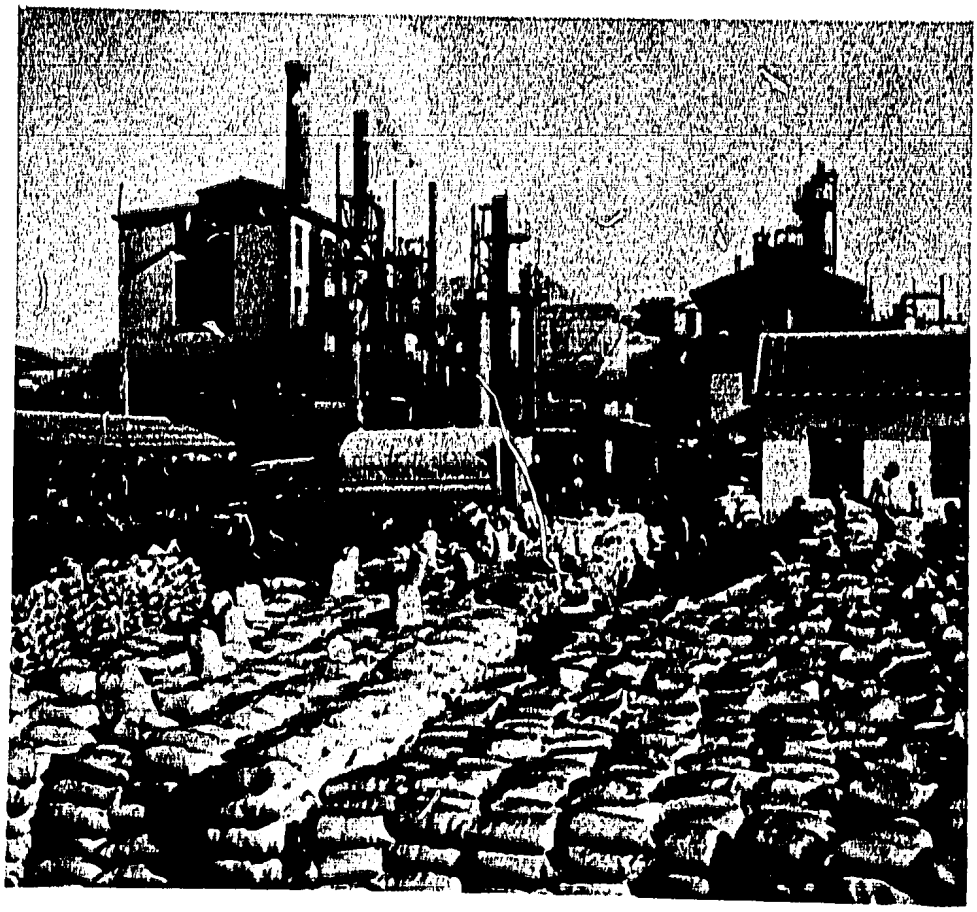
16. Although construction of the small fertilizer plants is widespread, building efforts are especially intensive in the provinces of Kiangsu, Shantung, Hunan, Honan, Hopeh, and Kwangsi -- all major grain producing areas. By a rough count, in these six provinces alone, perhaps 260 plants were producing nitrogen or phosphorus fertilizer by mid-1970 and more are being built. Also, a number of similar facilities left unfinished during 1966 have been or soon will be completed, while other units in production prior to the Cultural Revolution have been renovated and enlarged.

17. The most important element in this program is the construction of small nitrogen fertilizer plants which are being built in large numbers and which embody significant technological improvements. Improvements suggested by experiences with similar plants in the mid-1960s include a revised flow process and standardized equipment of simpler design. The new plants are said to use less raw materials and electric power. The total number of small nitrogen-producing plants seems to be somewhat over 150. These plants have capacities ranging from about 2,000 to 10,000 tons per year of synthetic ammonia with the great majority between 3,000 and 5,000 tons.

18. All of these nitrogen plants convert synthetic ammonia into ammonia water and many have the capability also of manufacturing a second product, ammonium bicarbonate* (see photo No. 1). Both of these fertilizer products are low quality; the nutrient (nitrogen) content of each is well under the Chinese "standard unit -- 20% N content" for nitrogen fertilizers. In the case of ammonia water, some ammonia content is lost through vaporization at the different stages of handling (see photo No. 2). The output of small plants is nonetheless useful, especially in an economy with so much unskilled labor power.

19. Despite the regime's statements to the contrary, the small-scale nitrogen plants are

* *Chemical fertilizer technology in the Free World has reached a level where synthetic ammonia more commonly is converted to such high-quality products as urea and ammonium nitrate.*



Small Chinese-built Nitrogen Plant Producing Ammonium Bicarbonate Fertilizer in Fukien Province

complicated. They require strict controls on key equipment, they operate at high temperatures and elevated pressures, and they produce intermediate products which are combustible and explosive. Many provinces now are said to be able to produce complete sets of equipment for small nitrogen plants, while only a few could do so prior to the Cultural Revolution. However, except for minor parts replacement, fulfillment of equipment needs for nitrogen plants is clearly beyond the technical capacity of most machinery shops and "handicraft cooperatives" at the county and district levels. Most of the equipment appears to come from large provincial-level machinery plants.

Large Plants

20. After an intensive technical struggle lasting about 12 years, China now claims to have

A County-Run Nitrogen Plant Loading Ammonia Water Into Transport Boats for Delivery to Nearby Farms

succeeded in devising its own process and in fabricating the sophisticated equipment required for the production of urea fertilizer from large plants. Details of the process have not been revealed, but the regime claims that the modern, complete-recycling method is used and that the granular urea product is equal to advanced world standards. Urea has the highest percentage of nitrogen (46%) of all the major chemical fertilizers and is the lowest cost solid fertilizer produced anywhere.

21. Two, possibly three, of China's large nitrogen plants already have adopted the new process and are producing urea. The first installation, at the Shih-chia-chuang complex in Hopeh Province, was turning out urea by March 1969. Special structures were added to the complex for housing the urea shop. The second installation was set up at a newly built, large nitrogen works located at Chu-chou in Hunan Province. This plant was reported to have begun "serial production of urea" by May 1970.

22. A third possible installation is at the Lan-chou Chemical Fertilizer Plant in Kansu Province. As this plant is near the Lan-chou Petrochemical Machinery Works where China's largest urea synthesis towers are produced, the fertilizer plant may have been supplied with one of these towers. The production capacities of the urea plants are unknown, but are not expected to exceed 40,000 tons annually. The regime has avoided making comments on its earlier and costly attempts to produce urea in a Shanghai plant at an annual rate of 40,000 tons.

23. A major part of China's success in developing a new urea process and in designing and fabricating the equipment may be due to intensive Chinese study of the urea plant (capacity of 175,000 tons per year) installed by a Dutch engineering firm at Lu-chou in Szechwan Province in 1965-66. China's machine building and metallurgical industries have combined efforts to construct highly sophisticated equipment that previously had to be imported.

24. Aggregate output from large fertilizer plants in 1969 probably was moderately above the 1968 level. Increases in production came from three new large facilities at Tsinan (Shantung Province), Chu-chou (Hunan Province), and K'unming (Yunnan Province). Construction on the K'unming plant was held up during the Cultural Revolution and the plant did not begin operation until April 1969.

25. There were also signs of increased output at other large fertilizer plants. For example, the Nan-ching plant in Kiangsu Province, one of China's largest producers of fertilizer, reported an output rise of 200% in 1969 over the 1968 level. This is in part because a workshop in the Nan-ching plant, left idle for 10 years, is now producing complex fertilizer, a high-grade product containing three basic nutrients -- nitrogen, phosphorus, and potassium. At the Kirin Chemical Fertilizer Plant, output between January and September 1969 was said to exceed output of the same period of 1968. In September, workers at the Kirin plant installed a new furnace for the

gasification of powdered coal, which yields high-quality gas for producing synthetic ammonia. This furnace, twice the size of similar units previously made in China, replaced an obsolete, low-capacity furnace which had been imported from the USSR in 1957.

26. In another example, a first-quarter 1969 report by the Lan-chou Nitrogen Fertilizer Plant (Kansu Province) claimed that production of synthetic ammonia had increased threefold over the same period in 1968. In April 1969 this plant completed a project proposed years before for recovering waste hydrogen gas from the Lan-chou Oil Refinery, thus making possible increased output of fertilizer later in the year.

27. In a number of large phosphorus fertilizer plants, production increases also resulted from the use of an improved process for converting low-quality phosphate ore into calcium superphosphate fertilizer. One such plant at Chan-chiang (Kwangtung Province) reportedly exceeded its production goal for 1969 and reduced the period for curing superphosphate from three weeks to one week without using extra equipment or labor.

Difficulties in 1969

28. Even though China's chemical fertilizer industry produced one million more tons in 1969 than in 1968, output does not appear to have been as high as the regime expected. Claims by several large plants of sizable percentage gains in output appear to reflect the low level of their operations in 1968. In addition, a number of plants still appear to be operating below peak production levels of 1966 and are experiencing difficulties in meeting their higher output quotas.

29. One plausible explanation for lagging production is a declining trend in the efficiency of installed plant equipment. Rather than suffer a production loss, some plants have continued to manufacture fertilizer while neglecting upkeep on the equipment. Even major items of equipment now require improvements, general overhaul, or replacement. A majority of China's large fertilizer

plants have been operating longer than five years -- up to 13 years in the case of the Soviet-supplied Kirin Chemical Fertilizer Plant. Further, chronic shortages in supplies of high-quality construction materials for fabricating fertilizer-producing equipment, as well as occasional substitution of lower quality materials in equipment, have meant that the useful life of Chinese machinery has fallen short of Free World standards. This concern was manifest in late 1969, when China's ministries of chemical and metallurgical industries held a conference at the Nan-ching Chemical Fertilizer Plant to study ways of improving the quality of steels used in manufacturing nitrogen fertilizer equipment for both large and small plants.

30. A second possible explanation for shortfalls in production at some large plants concerns problems in the supply of raw materials. The regime's decision to push for a sizable buildup in the metallurgical industry in 1969 resulted in a tightening of supplies of coke and coking coal available to the chemical fertilizer industry. Nitrogen fertilizer plants located in South and Central China had been largely dependent on the coal-rich areas in North and Northeast China for their coal supplies. Since late 1969, such provinces as Hupeh, Chekiang, Hunan, Kwangsi, and Kwangtung have been told by the regime to develop local coal resources. Fertilizer plants in these areas have found it necessary to switch to poorer grades of coal, chiefly those of low-carbon content, and even to coal dust, in order to manufacture synthetic ammonia. Instances have been reported where fertilizer plants apparently "succeeded" in using low-grade coals, but only after numerous experimental tests.

Total Fertilizer Supply

31. Between 1964 and 1966, Communist China's total supply of chemical fertilizer (product weight) increased by 70%, mainly because Peking was willing to pay for a doubling of fertilizer imports. Although imports went up by about 60% between 1966 and 1968, setbacks in domestic production almost offset the increased imports, and fertilizer supply rose by only 10%. Despite the drop in domestic production during the Cultural

Revolution, total supply reached new levels in both 1967 and 1968. In these years, however, because of late deliveries of imports, a depressed level of domestic production, and delays in transporting fertilizer to the farms, an important share of total supply in both years was not available in time to help the fall crops.

32. Between 1965 and 1970, China's total supply of chemical fertilizer increased by one-third. Domestic production climbed by 45% while imports rose one-fifth. The previous record domestic production level of 1966 was exceeded in 1969. Furthermore, now that most of the problems created by the Cultural Revolution have faded, the flow of imports of fertilizer is becoming more uniform and deliveries to farms more timely. Table 3 shows the expansion in the supply of chemical fertilizer during 1964-70. (For detailed estimates of the fertilizer supply, see the Appendix, Table 5.)

Table 3

Communist China:
Supply of Chemical Fertilizer

Million Metric Tons

Year	Product Weight a/	Nutrient Weight a/
1964	4.7	1.0
1965	6.8	1.5
1966	8.0	1.8
1967	8.3	1.9
1968	8.8	2.2
1969	9.9	2.4
1970	11.6 to 12.0	3.0 to 3.1

a. For the meaning of these terms, see the notes in Table 1.

33. Despite the growth of supply, China's consumption of chemical fertilizer still remains low by comparison with that of Japan. In 1969, for example, the amount of fertilizer nutrients available per hectare of sown area averaged only

about 17 kilograms, up from about 13 kilograms in 1967. Japan's consumption was 275 kilograms of nutrients during the 1967-68 fertilizer year (1 July - 30 June).

34. With no new internal upheavals, the supply of fertilizer should reach new records in the 1970s. Annual additions of one or two million tons to China's total supply of fertilizer will play an important role in easing the pressure of population on food supply in China. For example, the expected increase in total supply of fertilizer in 1970 is about 1.9 million tons of product, containing 590,000 tons of nutrient. If this amount were applied only to cereal crops under optimum conditions, an additional 5.3 million tons of grain could be produced.* At present levels of cereal consumption, this would be enough to feed an additional 20 million people. Normally, China's required annual increment of cereals to keep pace with the growth in population is on the order of four million tons.

Conclusions

35. The total supply of chemical fertilizer in Communist China reached a record level of 9.9 million metric tons in 1969 and is likely to be still higher in 1970 -- 11.6 million to 12.0 million tons. China is the third largest consumer of chemical fertilizer in the world -- exceeded only by the United States and the USSR -- yet application rates in China are still quite low. If all of the fertilizer nutrient available in 1969 had been applied on crops, the amount per hectare of sown area would have averaged only 17 kilograms, well under Japan's consumption of 275 kilograms per hectare.

36. Domestic production of chemical fertilizer has recovered from the disruptions of the Cultural Revolution. Although some important plants continue to have equipment problems and have not regained their former production levels, the majority

* *In actual practice, chemical fertilizers are applied on industrial crops such as cotton, sugar cane, and tobacco, as well as on cereal crops.*

of such plants are operating at higher rates. Construction of new large plants is going forward slowly, in part because the Chinese rely upon domestic design and equipment capabilities rather than imported technology and equipment. Recent Chinese claims that new small-scale plants contribute a heavy share of output are overstated, inasmuch as their products are of low quality.

37. Chinese imports of chemical fertilizer from 1964 through 1970 totaled 23.3 million tons, costing $1.21 billion -- an average annual cost of $173 million. Imports in 1969 were 4.1 million tons and in 1970 are likely to be 4.8 million tons. West European suppliers and Japan shared almost equally in the amounts delivered during 1969-70. Even though China's annual purchases have steadily risen and even though freight costs have gone up substantially, the average delivered cost to China declined by 16% from $173 per nutrient ton in 1967 to $145 per ton in 1970. The decline is partly the result of the rapid increase in worldwide fertilizer capacity and partly the result of shrewd Chinese bargaining. Peking's recent steps to enlarge the group of participating sellers should bring more pressure on the large fertilizer cartels in Western Europe and Japan to further trim their prices to China.

38. On the face of it, China might seem to be pursuing a shortsighted policy in importing chemical fertilizer rather than importing the equipment for fertilizer production. Other considerations, however, may make this a sensible policy, notably the continuing softness in world market prices for fertilizers and the shortage within China of technically skilled industrial labor versus unskilled farm labor.

APPENDIX

Statistical Tables

Table 4

Communist China: Imports of Chemical Fertilizer, by Supplier a/

Year and Supplier	Delivered Amount (Million Metric Tons)			Value (Million US $)	
	Product Weight b/	Equivalent Weight of Ammonium Sulfate c/	Nutrient Weight d/	f.o.b.	c.&f.
1964	1.221	1.541	0.357	58.9	65.2
Japan	1.058	1.346	0.312	52.1	57.2
Western Europe	0.144	0.179	0.042	6.0	7.2
Other	0.020	0.015	0.003	0.9	0.9
1965	2.314	2.799	0.635	127.4	144.3
Japan	1.192	1.429	0.342	70.1	74.9
Western Europe	1.052	1.339	0.281	53.7	65.5
Other	0.069	0.030	0.012	3.7	3.9
1966	2.519	3.390	0.722	135.6	152.8
Japan	1.424	2.033	0.437	86.4	92.1
Western Europe	1.057	1.329	0.279	48.0	59.5
Other	0.037	0.029	0.006	1.2	1.2
1967	4.283	5.370	1.155	157.5	200.1
Japan	1.750	2.306	0.493	66.6	73.9
Western Europe	2.474	3.037	0.643	88.4	123.5
Other	0.059	0.027	0.019	2.4	2.8
1968	4.000	5.748	1.236	157.7	201.0
Japan	1.760	2.597	0.551	74.0	80.8
Western Europe	2.211	3.142	0.673	82.4	118.6
Other	0.029	0.009	0.012	1.3	1.6
1969	4.118	6.207	1.315	162.7	202.5
Japan	1.917	3.002	0.631	80.8	88.4
Western Europe	2.156	3.120	0.662	79.7	111.1
Other	0.046	0.084	0.022	2.2	3.0
1970 e/	4.826	7.920	1.671	186	242
Japan	2.444	3.937	0.830	97	107
Western Europe	2.204	3.591	0.759	80	123
Other	0.179	0.391	0.082	9	12

a. Excluding imports of raw phosphate rock in any form. Because of rounding, components may not add to the totals shown.
b. Aggregate net shipping weight (excluding bagging materials) of all types and grades of imported chemical fertilizers.
c. The aggregate weight of nitrogen (N) nutrient in all imported chemical fertilizer is converted to equivalent tonnage of ammonium sulfate fertilizer, having a nitrogen content of 21%. Because of the high importance of nitrogen to agriculture and the convenience of expressing its amount in terms of a commonly used fertilizer, nitrogen is frequently reported as "equivalent weight of ammonium sulfate." The latter is derived by dividing "N weight" by 0.21.
d. Aggregate weight of primary nutrients -- nitrogen (N), phosphoric acid (P_2O_5), and potassium oxide (K_2O) -- contained in all imported chemical fertilizer.

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Table 5

Communist China: Production, Imports, and Supply of Chemical Fertilizer a/

Thousand Metric Tons

Year	Supply				Production b/				Imports c/			
	Total	Nitrogen Fertilizer	Phosphorus Fertilizer	Potassium Fertilizer	Total	Nitrogen Fertilizer	Phosphorus Fertilizer	Potassium Fertilizer	Total	Nitrogen Fertilizer	Phosphorus Fertilizer	Potassium Fertilizer
1964	4,720 (1,045)	3,340 (785)	1,380 (260)	Negl. Negl.	3,500 (685)	2,300 (460)	1,200 (225)	Negl. Negl.	1,220 (360)	1,040 (325)	180 (35)	Negl. Negl.
1965	6,815 (1,520)	5,095 (1,190)	1,710 (325)	10 (5)	4,500 (880)	3,000 (600)	1,500 (280)	Negl. Negl.	2,315 (635)	2,095 (590)	210 (45)	10 (5)
1966	8,020 (1,795)	6,190 (1,450)	1,830 (345)	Negl. Negl.	5,500 (1,075)	3,700 (740)	1,800 (335)	Negl. Negl.	2,520 (720)	2,490 (710)	30 (10)	Negl. Negl.
1967	8,285 (1,935)	6,830 (1,650)	1,425 (270)	30 (15)	4,000 (780)	2,600 (520)	1,400 (260)	Negl. Negl.	4,280 (1,155)	4,230 (1,139)	25 (10)	30 (15)
1968	8,800 (2,175)	7,140 (1,845)	1,620 (310)	35 (20)	4,800 (940)	3,200 (640)	1,600 (300)	Negl. Negl.	4,000 (1,235)	3,940 (1,205)	20 (10)	35 (20)
1969	9,920 (2,450)	8,095 (2,105)	1,810 (340)	15 (10)	5,800 (1,135)	4,000 (800)	1,800 (335)	Negl. Negl.	4,120 (1,315)	4,095 (1,305)	10 (5)	15 (10)
1970 d/	11,825 (3,040)	9,510 (2,600)	2,305 (430)	10 (5)	7,000 (1,370)	4,700 (940)	2,300 (430)	Negl. Negl.	4,825 (1,670)	4,810 (1,660)	5 (Negl.)	10 (5)

a. Data are given in two ways: product weight and actual weight of primary nutrient content -- nitrogen (N), phosphoric acid (P_2O_5), or potassium oxide (K_2O). Nutrient weights are shown in parentheses. Neither domestic production nor imports of raw phosphate rock in any form are included as chemical fertilizer. Data are rounded to nearest 5,000 metric tons.

b. Product weight of various types of chemical fertilizer after conversion to Chinese "standard fertilizer units" of fixed nutrient content: nitrogen fertilizers in terms of 20% N, phosphorus fertilizers of 18.7% P_2O_5, and potassium fertilizer of 40% K_2O.

c. Product weight data are aggregate net shipping weight (excluding bagging materials) of all types and grades of imported chemical fertilizer.

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